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AUTHOR Garbarino, Jennifer; Thompson, Bruce
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ABSTRACT

This study explored the development of attachment bonds in adolescents with diagnoses of attention deficit hyperactivity disorder (ADHD) and/or conduct disorder (CD). Participants included 102 mother/adolescent-child dyads from both rural and metropolitan areas and from six states. Subjects had received an ADHD diagnosis, a CD diagnosis, or a diagnosis of both ADHD and CD. Three scales measured the child's or adolescent's attachment with his or her mother. Another three measures examined the mother's own attachment style, the mother's own ADHD status, and the mother's overall maternal psychomedical functioning. Effect sizes from a discriminant analysis were statistically significant. Two patterns of group differences were identified. First, the group of children and adolescents with only ADHD were most likely to be in families with more intimate social relationships and supports. Secondly, children with only CD tended to be in families with poorer affective quality of relationships and in which mothers had higher ADHD scores themselves and were more likely to have avoidant attachments. Results support the need for interventions to focus on family, parenting, and relational issues. (Contains 62 references.) (DB)

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RUNNING HEAD: ADHD and/or Conduct Disorder

Child Attachment and Family Environment Differences of Adolescent Children with ADHD and/or Conduct Disorder

Jennifer Garbarino

Family and Community Enrichment Services

Bruce Thompson

Texas A&M University
and
Baylor College of Medicine

Jennifer Garbarino
422 Crest Dr
Redwood City, CA 94062
650/364-7410 (h)
650/591-9623 x19 (w)

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Paper presented at the annual meeting of the Southwest Educational Research Association, Dallas, January 27-29, 2000. The senior author may be contacted via e-mail address: "jgarbarino@mindspring.com". The junior author may be contacted via Internet URL: "http://acs.tamu.edu/~bbt6147/".

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Abstract

The present study explored the development of the attachment bonds as they relate to ADHD and Conduct Disorder (CD) diagnoses. Participants included 102 mother/adolescent-child dyads, from both rural and metropolitan areas from six states. Effect sizes from a discriminant analysis were statistically significant and noteworthy with potential implications for theory and/or intervention. Two patterns of group differences are interpreted with respect to related family dynamics.

Attention-deficit Hyperactivity Disorder (ADHD) is a disorder of childhood characterized by hyperactivity, short attention span, and impulsivity (American Psychiatric Association, 1994), all of which have been operationally defined as characteristics of temperament. These characteristics of ADHD have been shown to have partially a biological etiology have appears to have some genetic basis (Giedd, Castellanos, Casey, Kozich, King, Hamburger & Rapoport, 1994; Oosterlaan & Sergeant, 1996; Zametkin et al., 1990; Zametkin & Rapoport, 1986). It has been estimated that heritability explains or predicts roughly 30% to 50% of the variance in this diagnosis (Biederman et al., 1994), with environmental factors explaining the remaining 50% to 70%.

The Diagnostic and Statistical Manual of Mental Disorders, 4th edition, Revised (DSM-IV-R) of the American Psychiatric Association (1994) describes the diagnosis as beginning before the age of 7 years and requires that symptoms must be present for at least 6 months. Additionally, six or more symptoms of maladaptive and developmentally inconsistent inattention or hyperactivity-impulsivity must be present to apply the diagnosis. These impairments must be present in two or more settings, and there must be evidence of clinically significant impairment in social, academic, or occupational functioning. Other mental disorders (e.g., Schizophrenia, Anxiety Disorder, Dissociative Disorder, and Personality Disorder) must be ruled out as the cause of these symptoms, but co-morbid diagnoses (e.g., Conduct Disorder) are not precluded.

Incidence and Consequences

Epidemiological studies indicate that approximately 3-5% of

children in the United States may fit the ADHD diagnostic criteria (Barkley, 1990). This translates into *millions of children and their families* who are directly impacted by ADHD, not to mention additional children who are influenced by the presence of ADHD peers within their own classrooms.

Common developmental features of ADHD are onset in early childhood (mean 4 years), relative chronicity over time, general pervasiveness across situations, and deviance from age-based standards; psychosis, autism, and severe mental retardation must be excluded, but co-morbidity with learning and psychiatric disorders may occur (Barkley, 1995). However, because ADHD involves impulsivity, aggressive acting-out is common. Thus, there are a number of co-morbid diagnoses associated with ADHD, including Conduct Disorder, Antisocial Personality Disorder, Learning Disabilities, and mood disorders (Manuzza et al., 1993; Milberger, Biederman, Faraone, Murphy, & Tsuang, 1995).

Difficulty with peer relationships is characteristic as well. Noncompliance with parental and teacher requests and directives is often observed. ADHD children often have low self-esteem, are emotionally labile and prone to temper outbursts, and have low frustration tolerance.

Furthermore, follow-up investigations confirm that from 10% to 60% of diagnosed children *continue to have problems as adults* (Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993; Nadeau, 1995; Weiss & Hechtman, 1986; Wender, 1995). The educational outcomes and socioeconomic status of adults with ADHD are below those of siblings.

According to Denkla (1993), "Good intelligence and the absence

of aggressivity (within-individual) combine with favorable family environment (around-individual) to predict benign adult status" (p. 115). Thus, to the ADHD child, the interaction between their own symptoms and the stability and reactivity of the environment may have a major impact on the management of the disorder and adaptive outcomes for the child. The implication is that the environmental reactivity may magnify and exacerbate the disorder and lead to the development of co-morbid status, such as *Conduct Disorder*.

Recent studies have developed a conceptual model of Attention Deficit Hyperactivity Disorder as a disorder of self-regulation or executive function. This is, in effect, a reconceptualization of ADHD as a developmental disorder of self-regulation, arising from a deficit in behavioral inhibition that in turn causes a deficiency in behavior regulation by internally represented information or events (Barkley, 1995). Recent neuroimaging studies localizing ADHD to the prefrontal lobes and striatum lend support to this model. One such study conducted PET scans during an attention task, comparing ADHD adults and normal controls. The PET scans indicated reductions in glucose metabolism in the frontal cortex and pre-frontal areas in the ADHD adults (Zametkin et al., 1990).

The effect of stimulant medication in treatment of ADHD has been called "paradoxical" because stimulants calm down hyperactive behavior. This class of drugs appears to cause a stimulation of neurotransmitter activity in the frontal and pre-frontal areas of the brain, which are important in control of motor activity, inhibition of inappropriate response, and attention. In hyperactive individuals amphetamines provide otherwise missing stimulation in these regions thus increasing control and obviating the need for as

much stimulation from other sources (Leimkuhler, 1994).

Purpose of the Study

The purpose of the present study was to describe differences in child attachment and family environment variables associated with ADHD classification. The mediational influences of attachment and environmental forces upon the development of co-morbid Conduct Disorder (CD) diagnosis (American Psychiatric Association, 1994) was also investigated.

Specifically, the mediational impact of child attachment style and family environmental factors associated with ADHD and/or Conduct Disorder was investigated, with the following null hypothesis being tested:

> There are no statistically significant differences across children who are (a) ADHD only, (b) conduct disordered only, or (c) both ADHD and conduct disordered as regards the vectors of means on *child attachment* (child's scores on Parental Attachment Questionnaire scales: relationship, autonomy, support) and *environment* (mother's own Attachment Style Questionnaire scores on scales: security, avoidance, anxiety; mother's own ADHD score on the Wender Utah Rating Scale; and mother's score on psychological and medical conditions Brief Symptom Inventory scale: global severity index) measures.

Theoretical and Empirical Framework for the Inquiry

Attachment Theory

John Bowlby's (1969) theory of attachment is currently the basis of considerable research on development as well as research on affective processes throughout the life span. According to attachment theory (Bowlby, 1969), human beings innately seek and

form attachments with others. Attachment is conceptualized as a fundamental form of behavior with its own internal motivation, distinct from feeding and sex, but no less important for survival.

Ainsworth and Wittig (1969) identified three primary patterns of quality of attachment: secure, anxious-avoidant, and anxious-ambivalent. *Secure* infants exhibit behavior in which they are active in play and also in seeking contact when distressed after a brief separation from an attachment figure. *Anxious-ambivalent* infants exhibit behavior in which they oscillate between seeking proximity and contact with the attachment figure, and resisting contact and interaction. *Anxious-avoidant* infants avoid the attachment figure during reunion, especially after any second brief absence. After such a separation, many such infants treat a stranger in a more friendly manner than their own mother.

The theory assumes that the developing infant's early attachment-related experiences are in time represented cognitively as an internal working model of both self and other that is subsequently influential throughout the lifespan. This working model carries an internalized set of beliefs that integrate perceptions of one's own competence and love worthiness (model of the self) with expectations regarding the availability and responsiveness of attachment figures (model of other) (Bartholomew & Horowitz, 1991).

The parent's own attachment styles may affect the psychosocial environment created for the ADHD child. Furthermore, the child's attachment style may mediate the child's processing of ADHD-related difficulties in the transactional social context of familial structure and support.

Effect Sizes for Risk Factors

The family-genetic and psychosocial risk factors associated with ADHD impact the temperamental difficulties of the child. Child temperament can apparently be either improved or worsened by the type of home environment parents create and the manner in which they respond to the child. Additionally, parent and sibling mental health problems and family dysfunction may be more likely to occur in the presence of these children.

ADHD Symptomology of Other Family Members. According to Edwards, Schulz, and Long (1995), many parents of children with ADHD report that they or their other children had a positive history of ADHD symptoms. It is estimated that 15-20% of mothers and 20-30% of fathers have or may have had a positive history of previous ADHD symptoms. It is also reported that 26% of the siblings of children with ADHD also have the disorder (Barkley, 1990).

In a study of adults with clinical diagnoses of childhood onset of the disorder, 84% of the adults with ADHD who had children had at least one child with the disorder, and 52% had two or more children with the disorder (Biederman et al., 1995). Goodman and Stevenson (1989) examined the heritability of hyperactivity among 127 monozygotic and 111 dizygotic twins. Concordance rates for diagnosed hyperactivity was 51% for monozygotic twins and 33% for dizygotic twins. These investigators estimated heritability for the traits of ADHD to be 30-50%.

However, according to Biederman et al. (1995), adverse environmental factors such as severe marital discord, low social class, large family size, paternal criminality, maternal mental

disorder, and foster placement, are also risk factors for ADHD diagnosis. In his review of the literature, Barkley (1990) concluded that heredity appears to play the largest role in the occurrence of ADHD. He suggested that what may be transmitted genetically is a tendency toward dopamine depletion in, or underactivity of, the prefrontal-striatal-limbic regions of the brain, which may then be exacerbated by various biological and environmental factors (p. 377).

Edwards et al. (1995) reported that parents of children with ADHD appear to be more likely to have a history of numerous problems including antisocial behavior, alcoholism, and learning disabilities. Morrison (1980), in a replication study of two earlier investigations, found a prevalence of antisocial personality and somatization disorder among parents of children with ADHD. According to Biederman, Faraone, Keenan, Knee, and Tsuang (1990), a higher prevalence of affective disorders, especially depression, has also been reported for parents and siblings with ADHD (27-32%) as compared to controls (6%).

However, children with ADHD who display little or no aggressive or oppositional behavior are more likely to have parents with a much lower incidence of these mental health problems. Additionally, children with ADHD and no conduct problems are more likely to have relatives with ADHD, learning problems, and dysthymia, whereas children with conduct disorder are more likely to have relatives with conduct disorder, antisocial behavior, substance abuse, depression, and marital dysfunction (Biederman, Munir, & Knee, 1987; Faraone, Biederman, Chen, Milberger, Warburton, & Tsuang, 1995). Barkley, Fischer, Edelbrock, and

Smallish (1990) found in an 8-year follow-up study that 54% of biological parents of children with ADHD were likely to be separated or divorced versus 15% of parents of children without ADHD.

In sum, there are high rates of heritability of the disorder, as well as associated psychiatric, cognitive, and psychosocial impairments in the family members of ADHD children, bringing credence to a premise that there is a partially biological basis of the disorder. However, these factors can also apparently be mediated by the psychosocial features of family environment.

Psychosocial Environment and Attachment. The nature of the psychosocial environment and the quality of the child's attachments to significant others may help discriminate between children with attention deficit disorder with emerging conduct disorder and aggression from those with attention deficit disorder without aggressive behavior and with long-term benign outcomes (Jensen, Shervette, Xenasis & Bain, 1988, p. 800).

Lambert (1988), in a study of adolescent outcomes for hyperactive children, examined two developmental periods over which the early life contributions of biological and psychological characteristics, family environments, social relationships, cognitive and academic status, and school behavior were exhibited (n=166). Patterns of individual characteristics and environmental process variables that were predictive of several adolescent outcomes were identified. These longitudinal data supported the inference that a combination of early biological factors--prenatal, perinatal, and postnatal conditions, health and early temperament--as well as family characteristics and stability predispose the

child for adolescent mental health problems of depression (r^2=.15), aggressive conduct disorders (r^2=.19), nonaggressive conduct disorders(r^2=.24), and psychological treatment (r^2=.18). The effects on conduct disorders increase substantially when a combination of early biological factors with the later familial, social and cognitive factors are examined [aggressive conduct disorders (r^2=.28), and nonaggressive conduct disorders (r^2=.33)].

Reciprocity of Parent-child Modeling. The parent-child interactions of ADHD children have been the focus of a number of studies over the past 15 years. The bulk of these findings suggest that it is the major behavioral patterns of ADHD (e.g., inattention, restlessness) that result in the noncompliance of ADHD children, reduced responsiveness to parental interactions, and excessive negativity. These patterns of behavior then transactionally elicit from parents excessive controlling reactions as well as reduced responsiveness to the children's initiatives (Barkley, Anastopoulos, Guevremont, & Fletcher, 1992).

Tallmadge and Barkley (1993) examined the interactions of fathers and mothers with their hyperactive and normal children during both free-play and task periods. Difference in parent-hyperactive child versus parent-normal child interactions were found (r^2=.08). There was also a difference between the types of interaction patterns depending on whether the interaction occurred during a free-play or a task condition. Mothers and fathers of hyperactive boys gave more commands than did mothers and fathers of normal children (r^2=.19).

Along this same line, Barkley et al. (1992) evaluated the

parent-child interactions of ADHD children, subdividing them on the basis of ADHD with co-existing Oppositional-Defiant Disorder (ODD; American Psychiatric Association, 1994) and ADHD without ODD to evaluate which of these disorders most contributed to the observed parent-child interaction conflicts. While ODD is often conceptualized in the clinical literature as a set of characteristics specific to the child, the model of Patterson, DeBaryshe, and Ramsey (1989) has been particularly influential in understanding the role of family interaction patterns in promoting aggression and antisocial activities in young children. In the Patterson et al. model of coercive family process, parents shape and maintain overtly defiant and aggressive behavior through harsh, punitive interchanges and subsequent backing down from prior demands, both modeling and negatively reinforcing the child's defiance and hostility.

Results indicated that mothers of adolescents referred for ADHD described their relationships with their teenagers as having more negative communication patterns (r^2=.22), involving more issues of conflict (r^2=.18), and involving greater intensity of anger during those interaction conflicts (r^2=.15) than did mothers of adolescents in the control group. These family communication and interaction problems were likely to be reported by mothers regardless of whether the ADHD adolescent also manifested co-morbid ODD. Only adolescents with both ADHD and ODD, however, were likely to report greater communication problems, family conflicts, and anger during these conflicts, both with their mothers (r^2=.12; r^2=.10; r^2=.11) and fathers (r^2=.09; r^2=.06; r^2=.08).

An important discovery in the research on interaction patterns, however, is that when the ADHD child's behavior is brought under better control with stimulant medication, the parent's negativity and control reciprocally diminish. According to Barkley (1989), the severity of the ADHD child's behavior problems may be predictive of greater mother-child conflict and the resulting coercive behavior and poor child management skills on the part of the mother. The findings from an investigation of this hypothesis supported a positive effect of methylphenidate on the parent-child interactions of preschool ADHD children. In this study, as child compliance improved, mothers softened their management style to accommodate this improvement from the medication. This result supported the *bi-directional* model of reciprocal effects in parent-child interactions articulated by Bell and Harper (1977) in which parent behaviors are viewed as contingently related to and elicited by child behaviors in the ongoing stream of parent-child exchanges.

Anderson, Hinshaw and Simmel (1994) attempted to ascertain the ability of negative maternal behavior observed during mother-son interactions to predict overt and covert externalizing behavior in the child. Maternal negativity did not independently explain the child's aggression, but did explain 9% of the variance in noncompliance (overt) and stealing (covert) behaviors. Child negativity accounted for 14% of the variance of noncompliance. The child's conduct disorder (CD; American Psychiatric Association, 1994) status was the prime elicitor of negative maternal behavior, suggesting child effects on parent interaction style. Mothers of CD youngsters were the most coercive when interacting with their own

boys, signaling the importance of a cumulative history of discordant parent-child interchanges. Maternal stress and depression, as well as child negative temperament, may contribute to extremes of coercive behavior. Essentially, *some parents and children appear to train each other to respond in an increasingly negative manner* (Chiariello & Orvaschel, 1995).

Method

Participants

Participants in the present study were 102 mother/adolescent-child dyads, from both rural and metropolitan areas of Texas, Louisiana, Arkansas, Oklahoma, New Mexico, and Wyoming. We intentionally sampled mother-child dyads from diverse multi-state regions in order to maximize the generalizability of our results.

Participants included both adolescents who had received a primary DSM-IV diagnosis of ADHD, as well as non-referred adolescents. Participants in the ADHD groups were recruited from members of the Attention Deficit Disorders Association Parent Support Group, Southern Region, with headquarters in Houston, Texas. Participants in the non-referred groups were recruited from community facilities (e.g., physician offices) in Southeast Texas, Southeast Wyoming, and South Louisiana at which a diagnosis was being undertaken.

Table 1 presents a description of the sample demographic both for the total sample and within groups. The SES scores were determined by the Two Factor Index of Social Position (Hollingshead, 1957). Occupation and education were the two factors utilized to determine within approximate limits the social position an individual occupies in the status structure of our society.

These factors were scaled according to a hierarchy ranging from the low evaluation of unskilled physical labor toward the more prestigious use of skill, through the creative talents of ideas, and management over large business enterprises. The educational scale was divided into the following positions: graduate professional training, standard university graduation, partial college training, high school graduates, and partial high school. These factors were then combined by weighting the factors (see Hollingshead, 1957). The sum of these scores was then divided on a hierarchy of score groups into Social Class I, II, III, IV, V, with the highest SES being a score of I, and the lowest SES being a score of V.

INSERT TABLE 1 ABOUT HERE.

Instrumentation: **Child** Characteristics

The first two measures were used to confirm classifications of children as ADHD and/or Conduct Disordered. The third child measure yielded scores on three scales measuring the child's attachment with the child's mother. Theoretically, the child's attachment style should mediate perceptions of self and others, and also may transactionally influence the child's psychosocial family environment.

Attention Deficit Disorders Evaluation Scale (ADDES). The overall frequency and severity of adolescent ADHD symptomatology was assessed via the total score from the ADDES (McCarney, 1995), which was developed to aid in diagnosis, placement, and planning for Attention-Deficit/Hyperactivity Disordered children and

adolescents from 4.5-19 years of age.

Child Behavior Checklist (CBCL). The impact of additional behavioral or emotional complications was addressed through scores derived from the parent-completed Child Behavior Checklist (CBCL; Achenbach, 1991; Achenbach & Edelbrock, 1983). In particular, the Delinquent and Aggressive dimension and Externalizing T scores were used to measure the adolescent's conduct-disorder-related behaviors.

The Parental Attachment Questionnaire. The Parental Attachment Questionnaire (PAQ) (Kenny, 1987) is a 55-item self-report measure for use with adolescents and young adults, age 12-26. The measure is among the better measures of attachment (Garbarino, 1998).

Instrumentation: **Maternal** Characteristics

Three sets of constructs were measured by collecting data from the mothers within the 102 dyads. First, the mother's own attachment style was measured to reflect the quality and structure of the environment that the mother might be inclined to provide for the child. Second, given empirical findings that ADHD is partially predictable from parent ADHD status, either for genetic or envirnomental reasons (Biederman et al., 1995; Goodman & Stevenson, 1989), data were collected regarding the mother's own ADHD status. Finally, a global measure of maternal psychomedical functioning was administered, because these symptoms may transactionally mediate maternal ability to cope with ADHD symptoms.

Attachment Style Questionnaire. The Attachment Style Questionnaire (Feeney, Noller, & Hanrahan, 1994) was designed as a broad-based measure that could be used to clarify issues concerning the dimensions central to the mother's own attachment style.

Wender Utah Rating Scale. The overall frequency and severity of the mother's own ADHD symptomatology was assessed via the total score from the Wender Utah Rating Scale (Ward, Wender, & Reimherr, 1993).

Brief Symptom Inventory. A 53-Item Brief Symptom Inventory (Derogatis & Spencer, 1983) served as a basis for determining whether the mother was affected by various psychiatric and medical conditions. The BSI is a brief rating scale of various symptoms for adults.

Results

Preliminary Analysis

The APA Task Force on Statistical Inference recently noted that "Interpreting the size of observed effects requires an assessment of the reliability of the scores" (Wilkinson & The APA Task Force, 1999, p. 596), because score unreliability attenuates effect size. And it was emphasized that:

> It is important to remember that a test is not reliable or unreliable. Reliability is a property of the scores on a test for a particular population of examinees (Feldt & Brennan, 1989). Thus, authors should provide reliability coefficients of the scores for the data being analyzed even when the focus of their research is not psychometric. (p. 596)

In the present study reliability analyses for the scores on the instruments were calculated using coefficient alpha computed for our own data. It is essential to know how reliable the scores are for the sample in hand before any interpretations are made.

Reliability is not only a function of the instrument, but of the sample and other study features as well (Thompson, 1994b; Thompson & Vacha-Haase, 2000). It is in the reliability of the data in hand, and not the reliability of the scores in the normative sample, that impacts the effect sizes detected in a given study (Vacha-Haase, 1998). Notwithstanding this truism, a distressingly small proportion of articles present reliability coefficients for the data actually being analyzed (Meier & Davis, 1990; Thompson & Snyder, 1998; Vacha-Haase, Ness, Nilsson & Reetz, 1999; Willson, 1980).

Table 2 presents the alpha coefficients for our data. Four of the alpha coefficients ranged from .81 to .84; one coefficient was .89; the remaining six coefficients ranged from .93 to .98. The coefficients suggest that the 102 mothers and the 102 children carefully attended to the data collection procedures, and yielded 11 scores with reliabilities comparable to those reported in the instrument manuals.

INSERT TABLE 2 ABOUT HERE.

Group Membership Identification

The Attention Deficit Disorder Evaluation Scale (ADDES) and Child Behavior Checklist (CBCL) scores were used to classify the 102 adolescents into the three groups (ADHD only, conduct disordered only, or both ADHD and conduct disordered). ADHD was determined by converting the scores on the ADDES subscales to standard scores. The subscale standard scores provide a measure of the characteristics of ADHD measured by the scale (i.e.,

Inattentive and Hyperactive-Impulsive). The cutoff score determining the level of pathological behaviors relative to ADHD was a standard score of >3 (McCarney, 1995).

Additionally, the CBCL Externalizing subscale was included in the classification of Conduct Disordered. The subscale score was converted to a T-score, with a T-score > 65 indicating scores in the pathological range of conduct disorder (Achenbach, 1991).

Hypothesis Test

We tested the null hypothesis that there were no statistically significant differences across adolescents who are (a) ADHD only, (b) conduct disordered only, or (c) both ADHD and conduct disordered as regards the vectors of means on three *child attachment* scores (PAQ scales: relationship, autonomy, support) and five *child environment* scores involving mothers' own attachment scores, mothers' own ADHD scores, and mothers' global symptomology. We analyzed our data with multivariate methods (a) to avoid the inflation of experimentwise error rates that would otherwise occur, and (b) to better honor a reality in which variables co-exist and simultaneously influence each other (cf. Fish, 1988; Thompson, 1994a).

A one-way MANOVA/descriptive discriminant analysis (DDA) was conducted to describe differences across the three groups (i.e., ADHD only, conduct disordered only, both ADHD and conduct disordered) on the various response variables (cf. Huberty, 1994; Huberty & Barton, 1989). The number of possible DDA discriminant functions is (a) the number of groups (i.e., three) minus 1, or (b) the number of response variables (i.e., eight), whichever is smaller (i.e., here two).

In descriptive discriminant analysis, the focus is on effect size, and the standardized discriminent function coefficients and structure coefficients, while "hit rate" is relevant only in predictive discriminant analysis (Huberty, 1994). Effect size is increasingly being emphasized in the social sciences.

The APA (1994) publication manual "encouraged" (p. 18) effect size reporting. More recently, the APA Task Force on Statistical Inference issued its report, which emphasized, "Always provide some effect-size estimate when reporting a p value" (Wilkinson & The APA Task Force, 1999, p. 599, emphasis added). Later the Task Force also wrote,

> Always present effect sizes for primary outcomes.... It helps to add brief comments that place these effect sizes in a practical and theoretical context.... We must stress again that reporting and interpreting effect sizes in the context of previously reported effects is essential to good research. (p. 599, emphasis added)

Today, effect size reporting is "required" by journals such as Educational and Psychological Measurement (Thompson, 1994b), the APA Journal of Applied Psychology (Murphy, 1997), the Journal of Experimental Education (Heldref Foundation, 1997), and the Journal of Learning Disabilities. In multivariate analyses, one useful effect size is Wilks' lambda. Lambda is an r^2 and eta^2 (η^2) analog ranging from 0 to +1, *except* that lambda is scaled in the opposite direction. For example, a lambda of .75 is equivalent to an r^2 or an η^2 of .25.

In the present study the omnibus set of two descriptive

discriminant functions was statistically significant (lambda = .670, Rc = .46, χ^2 = 38.3, p = .001). The second descriptive discriminant function was also statistically significant (lambda = .845, Rc = .39, χ^2 = 16.1, p = .024).

An examination of the territorial map presented in Figure 1 indicated that Function I was primarily useful in describing response variable differences of the ADHD only adolescents (centroid [i.e., mean discriminant function score] = +.38) from the conduct disordered only (centroid = -.41) and especially the both ADHD and conduct disordered adolescents (centroid = -.82). The centroids on Function II suggest that this function was primarily useful in distinguishing the conduct disordered only adolescents (centroid = +.81) from the both ADHD and conduct disordered adolescents (centroid = -.51), ignoring the ADHD only adolescents (centroid = -.08).

INSERT FIGURE 1 ABOUT HERE.

The standardized function and structure coefficients were then consulted to determine on which of the response variables this pattern of group differences arose. These results are presented in Table 3.

INSERT TABLE 3 ABOUT HERE.

Discussion

Limitations

No study is without limitations, and our study was no exception. The 102 dyads in the present study underrepresented

lower socio-economic backgrounds. This occurred because we sampled from support groups and community facilities. Access to these supports and services is not structured to exclude families with lower socio-economic backgrounds, but as a practical matter many such families have fewer resources (e.g., time, transportation) with which to avail themselves of these opportunities.

Nevertheless, the sample of 102 mother-child dyads was drawn from a range of geographic locations. We were also afforded the opportunity to administer a fairly comprehensive battery of measures to the adolescents and mothers within these dyads. Furthermore, as suggested by the impressive alpha coefficients presented in Table 2, the adolescents and mothers in the study were engaged and generated reliable data in support of our analyses.

Interpretation

The lambda values (.670 and .845) were quite noteworthy. Consequently, the origins of these effects will be explored, and then some implications of our results will be offered.

DDA Function I. As noted in the Figure 1 territorial map of the discriminant function scores, as reflected by the mean discriminant function scores (i.e., centroids), this function primarily described differences associated with classification as ADHD-only (centroid = +.38) as against CD-only (-.41) and especially the both ADHD and conduct disordered adolescents (-.82). The standardized function and structure coefficients presented in Table 3 provide the basis for interpreting this result.

Regarding the child PAQ scores measuring attachment of the 102 adolescents with their mothers, a perusal of only the standardized function coefficients (SF) might suggest that of these three

variables Function I only involved the variable, Affective Quality of Relationships (SF = +.532). However, interpreting only the standardized weights in any general linear model analysis (e.g., regression, DDA) can lead to gross misinterpretations; the correlations of the variables with scores on the function (called structure coefficients--r_s) must also be interpreted, if the dynamics within the data are to be correctly portrayed (Burdenski, in press; Thompson, 1999).

The squared structure coefficients for the three child attachment variables ranged from 34.9% to 44.4%. These results indicate that the function (and consequently the pattern of mean differences reflected in the centroids on this function) involved the adolescents' global perceptions of attachment, and not only a single dimension of these connections.

As regards the mothers' scores, another intriguing pattern is also reflected in the function. The function involved the mothers' themselves feeling securely attached (SF = +.497; r_s = +.344).

The function also involved the mothers' scores on the Wender Utah Rating Scale (WURS), used as a measure of the mothers' own ADHD-related characteristics. As reported in Table 3, the standardized function and structure coefficients of this variable on this function were +.506 and +.005, respectively. In other words, this variable was virtually uncorrelated with discriminant scores on the function, and yet had an appreciable non-zero weight.

This pattern is called "suppression." A suppressor variable improves prediction indirectly by removing or suppressing extraneous variance in other variables (Horst, 1966; Lancaster, 1999). In this case, Function I largely involves the *difference*

between mothers' global severity scores on the Brief Symptom Inventory (-.808; r_s = -.460) with the mothers' ADHD-related scores and the mothers themselves feeling securely attached.

In aggregate, these results indicate that ADHD-only children (positive centroid), especially as against adolescents who were both ADHD and CD (negative centroid), generically felt *more* parental attachment, their mothers themselves felt *more* secure attachment, and the mothers had *lower* brief symptom inventory scores, especially after removing mothers' own ADHD-related scores from the mothers' symptom scores.

DDA Function II. As indicated by the group centroids, Function II mainly involved a description of differences of the CD-only group (+.81) from the children who were ADHD with co-morbid CD (-.51), largely ignoring the ADHD-only adolescents (-.08). Four variables shared between 10.5% and 13.1% of common variance with the scores on this DDA function: mothers' avoidant attachment (SF = +.851; r_s^2 = $+.325^2$ = 10.5%), child perceptions of Parents as Source of Support (SF = -.448; r_s^2 = $-.351^2$ = 12.3%), child perceptions of Affective Quality of Relationships (SF = -.255; r_s^2 = $-.360^2$ = 13.0%), and mothers' scores on a measure of ADHD-related characteristics (SF = +.743; r_s^2 = $+.362^2$ = 13.1%).

A suppressor effect was also present within Function II. The mothers' own secure attachment shared almost no variance with the discriminant function scores on this function (r_s^2 = 2.4%), and yet had by far the largest standardized function coefficient (+1.322).

In aggregate, these results suggest that differences between CD-only adolescents especially from children who are both ADHD and

CD are described primarily by the CD-only children having mothers with *higher* scores on their-own ADHD characteristics, mothers with *higher* scores themselves on Avoidant attachment, and the children having *lower* scores as regards perceived Affective Quality of Relationships, controlling the influence of the mothers' own Secure attachment.

Implications

Our theoretical model viewed child-parent relationships as being transactionally reciprocal, and not uni-directionally causal; that is, behaviors by adolescents and parents both model and reinforce behaviors of the reciprocal transactional partners. Empirical support for this view has been provided by before-and-after ADHD medication studies of family dynamics (cf. Barkley, 1989).

The canonical correlation for the first DDA function (.455) was slightly larger than that of the second function (.394). The first function contrasted the ADHD adolescents from both other groups, and especially the children who were both ADHD and CD, as indicated by the respective group centroids. This function involved a profile of child attachment with the mothers themselves having more Secure attachment and less non-ADHD-related symptomology. The ADHD-only children seem to reside in families with more intimate social relationships and supports, which mutually reinforce each other.

The development of Conduct Disorder alone or co-morbid CD is somewhat less likely in the presence of these dynamics, or the manifestation of CD damages these relationships, or both. But in any case, this pattern is descriptive of differences across these

families, regardless of etiology.

The second function primarily described differences in CD-only children from children with co-morbid ADHD and CD. CD-only children tended to reside in families with poorer Affective Quality of Relationships and in which mothers had higher ADHD scores themselves and were more likely to have Avoidant attachments themselves. These patterns may suggest a climate created by mothers who themselves have somewhat more psychological disfunction.

These findings suggest that family members interact as a social unit, which may mean that relevant interventions might appropriately invoke family therapy possible focusing on consistent parenting and relational issues. The finding of two noteworthy DDA functions suggests the presence of two discrete dynamics in describing the differences in the two different combinations of the three diagnostic groups. Additional such studies will shed further light on the different etiologies of manifestation and adaptation to ADHD and related co-morbid syndromes.

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Table 1
Description of the Sample (n=102)

Variable/ Statistic	Subsample: Both ADHD & Conduct Dis.	Subsample: Only Conduct Disordered	Subsample: Only ADHD	Total
n	20	19	63	102
Child's Age				
Mean	14.50	14.21	14.22	14.27
[SD]	[1.79]	[1.81]	[1.60]	[1.67]
Child's Gender				
Male	17 (85.0)	11 (57.9)	44 (69.8)	72 (70.6)
Female	3 (15.0)	8 (42.1)	19 (30.2)	30 (29.4)
n of Children				
Mean	2.30	2.37	2.06	2.17
[SD]	[0.86]	[1.16]	[1.08]	[1.05]
Parent's Age				
30-39	5 (25.0)	5 (26.3)	17 (27.0)	27 (26.5)
40-49	12 (60.0)	9 (47.4)	41 (65.1)	62 (60.8)
50-59	2 (10.0)	5 (26.3)	5 (7.9)	1 (1.0)
Other	1 (5.0)	0 (0.0)	0 (0.0)	0 (0.0)
Relation				
Birth	16 (80.0)	15 (78.9)	58 (92.1)	89 (87.3)
Adoptive	2 (10.0)	4 (21.1)	4 (6.3)	10 (9.8)
Other	2 (10.0)	0 (0.0)	1 (1.6)	3 (2.9)
Ethnicity				
Caucasian	19 (95.0)	16 (84.2)	57 (90.5)	92 (90.2)
African-Am.	0 (0.0)	3 (15.8)	4 (6.3)	7 (6.9)
Nat.-Amer.	0 (0.0)	0 (0.0)	2 (3.2)	2 (2.0)
Hispanic	1 (5.0)	0 (0.0)	0 (0.0)	1 (1.0)
Marital Status				
Married	15 (75.0)	14 (73.7)	44 (69.8)	73 (71.6)
Seper.-Div.	4 (20.0)	2 (10.5)	8 (12.7)	14 (13.7)
Remarried	1 (5.0)	3 (15.8)	7 (11.1)	11 (10.8)
Widow	0 (0.0)	0 (0.0)	3 (4.8)	3 (2.9)
Never Marr.	0 (0.0)	0 (0.0)	1 (1.0)	1 (1.0)
SES				
I	5 (25.0)	5 (26.3)	23 (36.5)	33 (32.4)
II	8 (40.0)	4 (21.1)	15 (23.8)	27 (26.5)
III	5 (25.0)	8 (42.1)	19 (30.2)	32 (31.4)
IV	2 (10.0)	1 (5.3)	6 (9.5)	9 (8.8)
V	0 (0.0)	1 (5.3)	0 (0.0)	1 (1.0)

Note. Percentages are reported in parentheses; standard deviations are reported in square brackets.

Table 2
Reliability Coefficients for Study Scores

Instrument/ Subscale	α
Child Measures	
Attention Deficit Disorders Evaluation Scale	
Inattention	.98
Hyperactivity	.98
Child Behavior Checklist	.94
Parental Attachment Questionnaire	
Affective Quality of Relationships	.93
Parental Fostering of Autonomy	.82
Parents as Source of Support	.81
Mother/Environment Measures	
Attachment Style Questionnaire	
Avoidant	.84
Secure	.84
Anxious	.89
Wender Utah Rating Scale	.94
Brief Symptom Inventory	.96

Note. The first two measures were used to confirm child classifications. The last four measures yielded the eight scores used as the response variables in the descriptive discriminant analysis.

Table 3
DDA/MANOVA Standardized Discriminant Function and Structure Coefficients

Variable	Function I			Function II		
	Function	Structure	Squared Structure	Function	Structure	Squared Structure
Child Variables						
Parental Attachment Questionnaire						
Affective Quality of Relationships	.532	.667	44.4%	-.255	-.360	13.0%
Parental Fostering of Autonomy	.185	.617	38.1%	.313	-.109	1.2%
Parents as Source of Support	.139	.591	34.9%	-.448	-.351	12.3%
Mother/Environment Variables						
Attachment Style Questionnaire						
Avoidant	.250	-.244	6.0%	.851	.325	10.5%
Secure	.497	.344	11.8%	1.322	.155	2.4%
Anxious	.198	-.182	3.3%	.436	.125	1.6%
Wender Utah Rating Scale	.506	.005	.0%	.743	.362	13.1%
BSI Global Severity Index	-.808	-.460	21.1%	-.154	.130	1.7%

Note. Structure coefficients greater than absolute .3 are underlined.

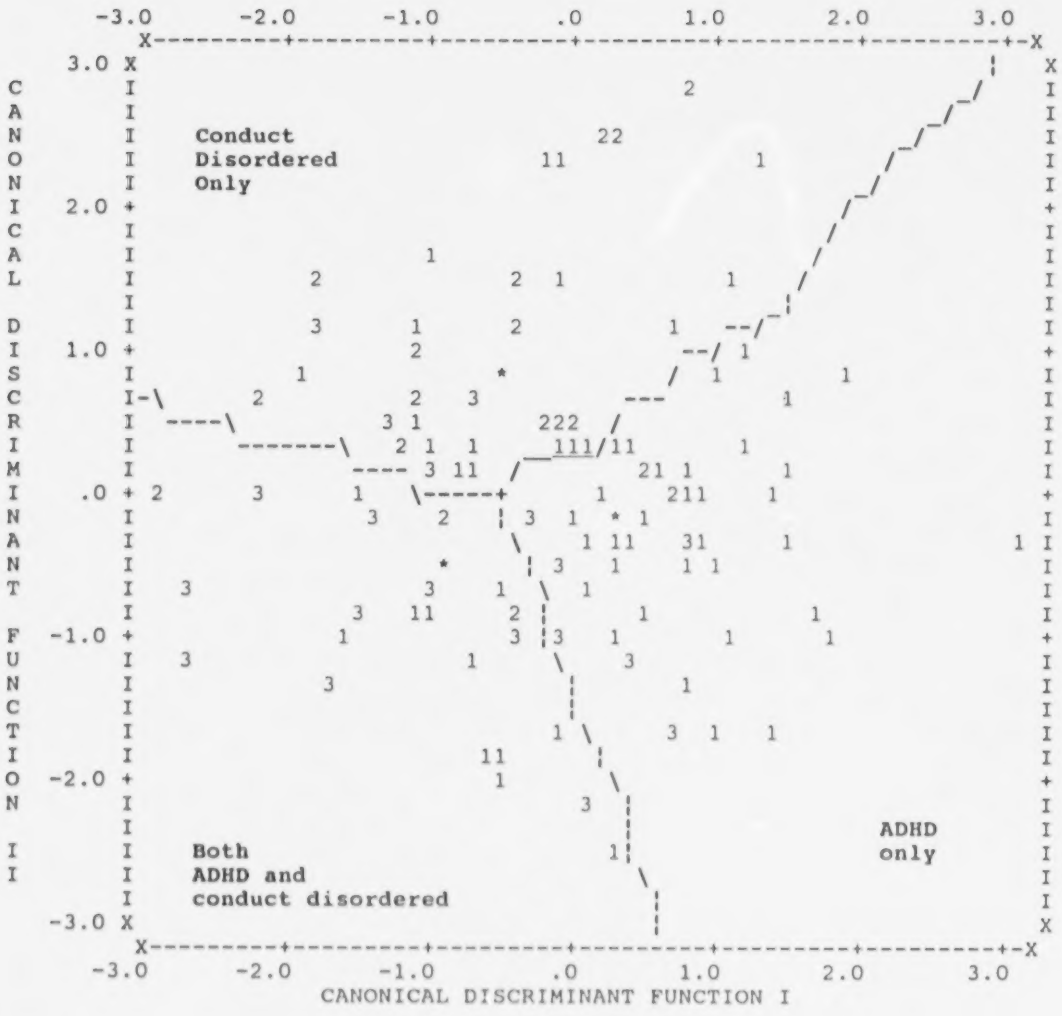

Figure 1. Territorial Map of the Discriminant Function Space.

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